PATENT SPECIFICATION

DRAWINGS ATTACHED

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961,989

Date of filing Complete Specification March 30, 1962.

Application Date April 13, 1961. *No. 13366/61.*

Complete Specification Published June 24, 1964.

Index at acceptance:—B2 F(G1A1, G1C, G3A, G3E, G10)

International Classification:—B 05

COMPLETE SPECIFICATION

Improvements in or relating to Apparatus for Distributing Powdered Materials

We, BRITISH CELLOPHANE LIMITED, a British Company, of Bath Road, Bridgwater, Somerset, do hereby declare the invention for which we pray that a patent may be granted to us and the method by which it is to be performed to be particularly described in and by the following statement:—

This invention relates to apparatus for distributing powdered materials.

It is often necessary to treat surfaces, such as the surfaces of cellulose film, synthetic plastic films or other sheet materials with powdered substances for various purposes. For example, in our copending Patent Application No. 6917/61 (Serial No 961988.) there is described a process for the treatment of a film having variations in thickness across its width wherein it can be wound into a roll substantially free of hard circumferential bands the process comprising applying a solid particulate material, such as starch, uniformly to one or both surfaces of the film prior to winding the film into a roll.

In order to obtain the desired effects, it is necessary to ensure that the amount of powdered material deposited per unit area of surface falls within specific limits and it is, therefore, necessary to exercise careful control over the rate of delivery of the material to the surface. This is particularly important where the amount of material applied to a unit area of surface is small, for example of the order of about 5 hundredths of a gram per square metre.

The object of the present invention is to provide a powder distributing apparatus having means for delivering a powdered material at a measured rate.

Accordingly, the present invention provides an apparatus for distributing powdered materials at a measured rate comprising a rotatable cylinder having uniformly distributed powder measuring pockets in its surface horizontally mounted in a stationary casing which encloses the pocket bearing surface, a feed opening in the casing through which a powdered material may be fed to fill pockets exposed at the feed opening, a driving means for rotating the cylinder, wiping means for wiping excess powdered material from the surface of the cylinder a discharge opening in the casing remote from the feed opening into which the powdered material is discharged from the pockets, an air inlet for introducing air into the discharge opening adjacent to the pockets and a fluid ejector having a suction inlet connected to the discharge opening whereby the powdered material is drawn into a fluid stream.

A hopper may be provided at the feed opening of the casing to accommodate and guide the powdered material into the feed opening and where the material is not free flowing (for example, starch), the hopper may be mechanically vibrated such as by tapping, to facilitate smooth feeding. Alternatively, the hopper may have a perforated plate, such as a plate of sintered metal, placed around the exit opening, through which air under pressure is forced to maintain the powdered material in the hopper in a fluidised state. The fluidised powdered material flows readily into the feed opening and into the powder measuring pockets.

The pockets formed in the surface of the cylinder may be of any size and distribution depending upon the desired rate of delivery of the powdered material. Preferably, the walls of the pockets either curve or slope inwardly to facilitate the removal of the powdered material at the discharge opening.

The removal of the powdered material from

the pockets may be facilitated by fixing a rotatable brush to rotate counterwise to the direction of travel of the drum surface and to brush out the contents of the pockets into the discharge opening.

The air-inlet may be simply an opening in the casing to the atmosphere through which air is drawn past the pockets by the suction applied by the fluid ejector. In another form, the air inlet may be a pipe open to the atmosphere and having holes or nozzles adjacent the pockets whereby under the influence of the suction applied by the ejector, air is drawn through the pipe and is directed through the nozzles on to the pockets to facilitate the complete removal of the powdered material. Alternatively, air may be blown through the pipe to increase the force of the air through the nozzles.

In one form of the invention, the casing is spaced from the surface of the cylinder to form an annular space into which the air-inlet opens at a position between the feed and discharge openings. To prevent powdered material being drawn from the hopper into the annular space by the suction caused by the ejector, the feed opening is shut off from the annular space by a doctor blade that is a blade urged against the circumferential surface of the cylinder to wipe off excess powdered material from the surface and a guard blade also urged into contact with the circumferential surface of the cylinder.

In another form of the invention, the casing forms a close fit with the cylinder surface when the edge of the casing at the feed opening forms the wiping means for wiping excess powdered materials from the surface of the cylinder.

The fluid ejector means may consist of a venturi or like tube supplied with a liquid or a gas, for example air, under pressure. The powdered material is drawn into the fluid stream which may then be led to a suitable nozzle for distribution of the particles on the desired surface.

The amount of powdered material discharged from the apparatus may be varied by selection of the size and distribution of the pockets in the surface of the cylinder or by varying the speed of rotation of the cylinder.

Following is a description by way of example and with reference to the drawings accompanying the provisional specification and the drawing accompanying the present specification of forms of apparatus constructed and adapted to operate in accordance with the invention.

In the drawings:—

Figure 1 is a side elevation, in section, of one form of the apparatus,

Figure 2 is a front elevation, in section, of the apparatus shown in Figure 1,

Figure 3 is an enlarged view of part of Figure 2,

Figure 4 is a side elevation, in section, of a second form of the apparatus,

Figure 5 is a perspective view of a spraying nozzle, and

Figure 6 is a front elevation of a third form of the apparatus.

In Figures 1 and 2, a chromium plated cylinder 1 which is two inches in diameter and three inches long, is mounted for rotation in a casing 2 and rotated by driving means (not shown) in the direction indicated by the arrow. The surface of the cylinder 1 is engraved, except for strips 3 half an inch wide at each end, with quadrangular pockets 4 (Figure 3) which are 0.012 inch deep and 0.04 inch square. The internal wall of the casing 2 is spaced from the cylinder 1 to form an annular space 5 into which opens a feed opening 6, at the top, a discharge opening 7 at the bottom and an air inlet opening 8 intermediate the feed and discharge openings 6 and 7. The feed opening 6 is shut off from the main part of the annular space 5 by a guard blade 9 and a doctor blade 10 which are mounted on rods 11, 12 and urged into contact with the surface of the cylinder 1 by spring and lever mechanisms 13 as shown in respect of blade 9 in Figure 2. The ends of the blades 9, 10 form a close fit with the body of the casing 2.

A hopper 14 for feeding powdered materials to the cylinder 1 is mounted above the feed opening 6 by means of a rubber mounting 15 and is agitated to facilitate feeding of the powdered materials by a hammer 16 urged by a spring 17 against a rotating trip cam 18. Within the annular space 5 and adjacent to the discharge opening 7, a rotatable brush 19 is mounted and rotated by means (not shown) in the same direction as the cylinder 1. The brush 19 sweeps out the contents of the pockets 4 towards the discharge opening 7. The discharge opening 7 is connected by a pipe 20 to the suction inlet 21 of a fluid ejector 22.

The apparatus operates as follows:—

A powdered material, such as starch, is introduced into the hopper 14 and the cylinder 1 is rotated at a convenient speed. The starch falls by gravity through the opening 6 on to the surface of the cylinder 1 where it fills the pockets 4 exposed between the blades 9, 10. As the cylinder 1 rotates, the doctor blade 10 wipes the surface of the cylinder 1 such that only powdered material present in the pockets 4 is carried past the blade 10. When the pockets 4 reach the discharge opening 7, the powdered material falls by gravity out of the pockets 4 and is sucked by air drawn through the air inlet 8 into the suction inlet 21 of the ejector 22. Any material remaining in the pockets 4 is swept out by the brush 19 and the empty

pockets 4 return to the feed opening 6 past the blade 9 for recharging with fresh material. The blade 9 ensures that powdered material in the hopper 14 is not drawn directly to the ejector 22 through the annular space 5. When the ejector 22 is connected to a source of compressed air, the particles of the powdered material are entrained in the air stream. The action of the hammer 16 on the hopper 14 facilitates the feeding of materials, such as starch, which are not entirely free flowing.

In a second form of the apparatus illustrated in Figure 4, the cylinder 1^1 is housed in a casing 23 consisting of a split block of asbestos reinforced polytetrafluoroethylene which is clamped by a screw 24 such that the casing 23 is in close contact with the cylinder 1^1 except for a feed opening 6^1 and discharge opening 7^1 and a split portion 25 in the casing 23. The split portion 25 provides the casing 23 with sufficient flexability to facilitate clamping to the cylinder 1^1. Powdered material fed to the feed opening 6^1 from the hopper 14^1 fills the exposed pockets 4^1 in the cylinder 1^1 and on rotation of the cylinder 1^1 past the edge 26 of the casing 23, the surface of the cylinder 1^1 is wiped so that only material carried by the pockets 4^1 passes the edge 26. The material is discharged from the pockets 4^1 at the discharge opening 7^1 partly by gravity and partly by a stream of air entering the opening 7^1 through an air inlet 27 cut in the casing 23 in line with the edge of the cylinder 1^1, under the influence of the suction applied through pipe 20^1 by the ejector (not shown).

The air-entrained particles of the powdered materials may be distributed or sprayed as required upon surfaces to be treated. In Figure 5, the output from an ejector consisting of entrained particles 28 of starch is projected on to a moving sheet 29 of cellulose film through a fan-shaped nozzle 30.

In a third form of apparatus illustrated in Figure 6, a hopper 31 has a perforated annular plate 32 of a sintered metal, level with the exit opening 33, for supporting the powdered material (not shown). The plate 32 forms an annular space 34 with the bottom 35 of the hopper 31 to which air is supplied under pressure through a pipe 36. The air forcing its way through the plate 32 maintains the powdered material in a fluidised state and facilitates the flow of the material through the exit opening 33 to the feed opening 6^1 of the body of the apparatus. The remainder of the apparatus is as shown in Figure 4 with the exception that the air inlet 27 is replaced by a pipe 37 open to the atmosphere at both ends and having a series of holes 38 drilled in the wall of the pipe 37 opposite to the pockets 4^1. On suction being applied to the discharge opening 7^1 by the air ejector, air is drawn through the pipe 37 and the holes 38 in the form of air jets which aid in removing powdered material from the pockets 4^1.

By means of the apparatus constructed in accordance with the invention, it is possible to supply powdered materials to surfaces at closely measured rates and in particular, it is possible to deliver the materials evenly in minute measured quantities per unit area of surface. Examples of powdered materials which may be employed are starch, resin coated starch, starch ester, diatomaceous earths, silica, talc and powdered resins.

Although air is a convenient particle entraining fluid for most purposes, other fluids such as liquids or vapours may also be employed by connecting a suitable supply of the fluid under pressure to the ejector.

WHAT WE CLAIM IS:—

1. Apparatus for distributing powdered materials at a measured rate comprising a rotatable cylinder, having uniformly distributed powder measuring pockets in its circumferential surface, horizontally mounted in a stationary casing which encloses the pocket bearing surface, a feed opening in the casing through which a powdered material may be fed to fill pockets exposed at the feed opening, a driving means for rotating the cylinder, a wiping means for wiping excess powdered material from the surface of the cylinders, a discharge opening in the casing remote from the feed opening into which the powdered material is discharged from the pockets, an air inlet for introducing air into the discharge opening adjacent to the pockets and a fluid ejector having a suction inlet connected to the discharge opening whereby the powdered material is drawn into a fluid stream.

2. Apparatus as claimed in claim 1 in which the casing is spaced from the surface of the cylinder to form an annular space and the feed opening is shut off from the annular space by a guard blade on one side of the feed opening and a doctor blade on the other side of the feed opening, both blades being urged into surface contact with the cylinder.

3. Apparatus as claimed in claim 1 in which the casing forms a close fit with the cylindrical surface of the cylinder and the edge of the casing at the feed opening wipes excess powdered material from the cylindrical surface of the cylinder.

4. Apparatus as claimed in claim 3 in which the material of which the casing is made comprises asbestos reinforced polytetrafluoroethylene.

5. Apparatus as claimed in any one of the preceding claims in which a rotatable brush is provided at the discharge opening to facilitate the removal of the powdered materials from the pockets.

6. Apparatus as claimed in any one of the claims 1 to 4 in which an air nozzle is

placed in the discharge opening for directing air jets into the pockets to remove the powdered materials.

7. Apparatus as claimed in any one of the preceding claims in which a vibrating hopper is provided for feeding the powdered material to the feed opening.

8. Apparatus as claimed in any one of the claims 1 to 6 in which a hopper is provided for feeding the powdered material to the feed opening, the hopper having a perforated plate around the exit opening and an air feeding means for forcing air through the plate to maintain the powdered material in the hopper in a fluidised state.

9. Apparatus as claimed in any one of the preceding claims in which the walls of the pockets are inwardly curved or sloped.

10. Apparatus as claimed in claim 9 in which the pockets are quandrangular.

11. Apparatus as claimed in any one of the preceding claims in which the fluid ejector is an air ejector.

12. Apparatus as claimed in any one of the preceding claims in which the output from the ejector is projected through a fan-shaped nozzle.

13. Apparatus as claimed in claim 1 substantially as described with reference to Figures 1, 2, 3 and 5 or Figure 4 accompanying the provisional specification or Figure 6.

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Leamington Spa: Printed for Her Majesty's Stationery Office by the Courier Press.—1964.
Published at The Patent Office, 25, Southampton Buildings, London, W.C.2, from which copies may be obtained.

961989 PROVISIONAL SPECIFICATION

1 SHEET *This drawing is a reproduction of the Original on a reduced scale*

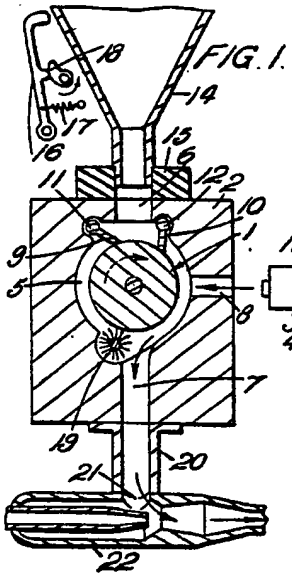

FIG. 1.

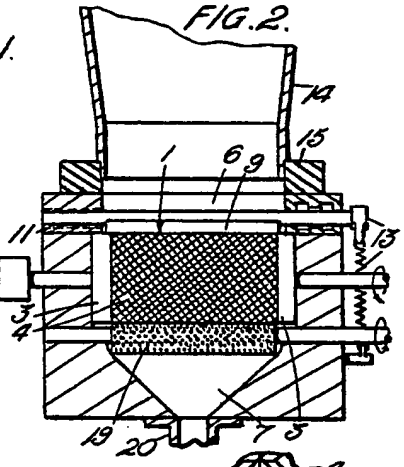

FIG. 2.

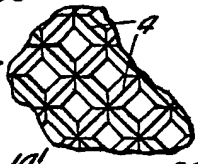

FIG. 3.

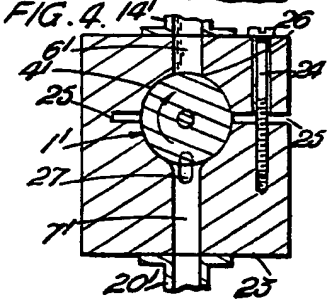

FIG. 4.

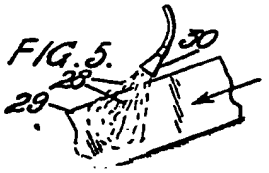

FIG. 5.

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1 SHEET *This drawing is a reproduction of the Original on a reduced scale*

FIG. 6.